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10 **METHOD AND APPARATUS PROVIDING CALLER IDENTIFICATION**
 TELEPHONE SERVICE WITH A REAL TIME AUDIO MESSAGE

Field of the Invention

15 The present invention relates generally to a method and apparatus for
providing caller identification in telephone systems and, more particularly, concerns
providing a real time audio message in a telephone system before a connection is
established between a calling party and a called party.

Background of the Invention

20 Today, calling party identification (Caller ID) service is widely available
in most industrialized countries. A fundamental method and apparatus for
providing Caller ID service in a telephone communication system are disclosed in
U.S. Patent No. 4,551,581 granted November 5, 1985 to C.A. Doughty, and a
fundamental method and apparatus for receiving Caller ID information at a
25 telephone receiver are disclosed in U.S. patent No. 4,582,956 granted to C.A.
Doughty on April 15, 1986. The disclosures of these patents are incorporated
herein by reference.

30 Conventional Caller ID equipment provides an identification of the
calling party to the called party's telephone customer premises equipment before
a telephone connection is established. That is, the Caller ID information is provided
to the called party while his telephone equipment remains in an "on-hook" state.

Specifically, the central office alerts a called party to an incoming message by ringing his telephone equipment. A ringing signal is applied to the telephone equipment intermittently, with a silent interval being provided between consecutive rings of telephone equipment. When the called party lifts the telephone receiver, the telephone equipment assumes an "off-hook" state, but prior to that time, it remains in an "on-hook" state. Generally, caller ID information is transmitted to the called party's telephone equipment during the "on-hook" state in the silent interval between the first and second rings, but it may come prior to the first ring, after which the Caller ID information is displayed to the called party. ,

A shortcoming of conventional Caller ID service is that it does not identify the actual calling party, but only the telephone equipment from which the call is being made. When a party is identified, it is the registered owner of the telephone equipment from which the call is being made. Thus, when the calling party calls from telephone equipment which is shared among many individuals, from a telephone at a site he is only visiting, from a pay telephone, or through a PBX, the called party cannot identify the actual calling party without going "off-hook" on his telephone equipment and speaking to the calling party. This, however, defeats the intended purpose of Caller ID service.

In accordance with the present invention, a Caller ID service is provided which permits the calling party to speak a real time audio message that can be received and played by the called party's Caller ID equipment while his telephone equipment remains in the "on-hook" state. A calling party which has Audio Caller ID (ACID) service would speak a short audio message before dialing the called party. That message is converted to digital form, optionally compressed, and transferred to the called party in a manner similar to conventional Caller ID information. The called party's Caller ID equipment operates in the conventional manner, except that the received Audio Caller ID signal is recognized as an audio signal. At the site of the called party, a decoder is provided to convert the digital

signal to an analog audio signal, and this analog signal is provided to a speaker, which plays back the calling party's audio message.

Preferably, conventional Caller ID operation is preserved when Audio Caller ID service is provided. This is achieved by sending the Audio Caller ID data in the silent interval following the second ring. The audio Caller ID equipment treats any signal received after the first ring as a conventional caller ID signal and any signal received after the second ring as an Audio Caller ID signal. An Audio Caller ID receiver could then store conventional Caller ID information in the conventional manner (i.e. allowing the called party to view information about a predetermined number of received calls), while also permitting an audio message or clip to be stored in association with each call. The Audio caller ID may also be sent during rings or regardless of rings.

Brief Description of the Drawings

The foregoing brief description, as well as other features and advantages of the present invention, will be understood more completely from the following detailed description of a presently preferred, but nonetheless illustrative, embodiment, with reference being had to the accompanying drawings, in which:

Fig. 1 is a waveform diagram representing the operating signals in a conventional Caller ID system;

Fig. 2 illustrates the message format in a conventional Caller ID system;

Fig. 3 is a functional block diagram illustrating the structure of a conventional Caller ID receiver;

Fig. 4 is a functional block diagram illustrating a preferred embodiment of an Audio Caller ID receiver in accordance with the present invention; and

Fig. 5 is a functional block diagram illustrating a preferred embodiment of an Audio Caller ID transmitter in accordance with the present invention.

Detailed Description of the Preferred Embodiment

Turning now to Fig. 1, there is illustrated a waveform representing the operating signals in a conventional Caller ID system, all signals being plotted against time. These are the signals typically produced at the central office and presented to the called party's telephone customer premises equipment. Signals 10 and 12 represent the first and second ring signals, which are separated by a first silent interval 14. Each ringing signal is typically a 20Hz, 86 volt RMS sine wave superimposed on -48 volts and is produced at the central office on the ring lead to indicate to a customer's called telephone equipment that a telephone call is being received. Each ringing signal has a duration of approximately two seconds, and the silent interval is approximately four seconds. Although not shown in Fig. 1, it will be understood that in the conventional telephone system ringing signal 12 is followed by a second silent interval, a third ringing signal, a third silent interval, etc. These ringing signals and silent intervals continue until the called party's telephone equipment goes off-hook.

In a conventional Caller ID system, Caller ID information is introduced in the first silent interval 14. The Caller ID information is in the form of a frequency shift keyed (FSK) signal received a short interval 18 after the termination of the ringing signal. Interval 18 typically has a 300-350 millisecond duration. The FSK signal 20 contains two carrier frequencies, such as 2100 and 2200 Hz, which represent the low or "0" and higher "1" logic levels, respectively, of a serial data message. During an interval 20, a continuous frequency signal, such as 2100 Hz is transmitted, to permit the Caller ID equipment and the called telephone to initialize. This is followed by an interval 22 during which a modulated FSK signal representing a data message is introduced. This data message contains the Caller ID information.

The data message is typically composed of a series of 8 bit characters each preceded by a start bit and followed by stop bit. Figure 2 illustrates a typical message format. The first character 30 identifies the type of message, such as a

calling station directory number, an alpha-numeric message, special service indication etc. The second character 32 represents the number of characters that follow. The following data characters 34 represent the actual information to be transmitted, such as the calling station directory number, and the last character 36 is a checksum character, which provides error correction.

Figure 3 is a functional block diagram of a typical prior art Caller ID receiver 40, which is connected to a telephone line L in parallel with conventional telephone receiving equipment R. Caller ID receiver 40 includes a ring detector 42, which is connected to the telephone line L and controls a normally open switch 44, which is also connected to the telephone line. At the output of switch 44, there is provided an AC coupler 46 designed to transmit FSK frequencies, but to block the low frequency ringing signal. The AC coupler is connected to an FSK demodulator 48, the output of which is provided to a convertor 49, which provides serial data as an output.

In operation, when ring detector 42 detects the first ringing signal on telephone line L, it causes switch 44 to close. The ringing signal is, however, blocked by coupler 46. On the other hand, when signals in the FSK band begin to appear on telephone line L, they are transmitted through coupler 46 to demodulator 48. The demodulator output signal is then converted by convertor 49 to a serial data stream. Typically, the serial data is provided to a display, so that the Caller ID information may be displayed to the user.

Figure 4 illustrates a preferred embodiment 50 of an Audio Caller ID receiver in accordance with the present invention. In receiver 50, components which are identical to components incorporated in receiver 40 are identified with the same reference character, operate in the same manner as in receiver 40, and will not be described further. A ring detector 42' is connected to telephone line L. This device is similar to a conventional ring detector, except that it includes a counter so that it is able to determine when the second ringing signal is received. It is assumed that receiver 50 will be providing conventional serial data in the same

manner as receiver 40, so that it will be capable of operating as conventional Caller ID receiver as well. The serial data is, however, also provided to a digital audio decoder 52, which is enabled by the second signal received from ring detector 42' over lead 51. The output of digital audio decoder 52 is provided through audio
 5 amplifier 54 to a speaker 56, or the like. It should also be appreciated that the signal from amplifier 54 could be provided to the ear piece of the telephone set when receiver 50 is part of a integrated unit incorporating a telephone receiver.

In operation, ring detector 42' will enable digital audio decoder 52 when it detects the second ring signal. Thereafter, serial data provided at the
 10 output of convertor 49 will be converted by decoder 52 from digital audio to an analog audio signal which is amplified and played over speaker 56. It should be appreciated that the serial data received by decoder 52 may be a compressed digital audio signal, in which case the decoder 52 would include the necessary components to decompress the signal prior to decoding it.

15 Figure 5 is a block diagram illustrating a preferred embodiment 60 of an audio Caller ID transmitter in accordance with the present invention. Transmitter 60 includes an enabling switch, such as a push button 62 which a user presses when he wishes to store an audio message that is to be sent to a receiver. Operating switch 62 causes a predetermined triggering signal to appear on leads
 20 61 and 63. The signal on lead 61 causes a digital audio encoder 62 to be enabled, whereby the operator may digitally encode an audio signal provided by a microphone 66 and audio amplifier 68 to encoder 64. A digital signal from encoder 64 is stored in a storage unit 70. It should be appreciated that encoder 64 may include components for compressing the digital audio signal. Storage unit 70 is
 25 connected to a converter 72, which converts digital words stored in unit 70 to a serial data stream. The serial data stream is provided through an FSK modulator 74 to a transmitter circuit 76. The output of transmitter circuit 76 is coupled to the telephone line L, and the transmitter circuit also receives a control input from

the telephone line. Also connected to telephone line L is an off-hook detector 78, which enables transmitter circuit 76.

In operation, the user preferably records an audio message prior to going off hook on his telephone transmitter. Alternatively, the user may begin recording when he hears the dial tone. He begins recording by operating the switch 62, at which point encoder 64 and transmitter circuit 76 are placed in a ready state. The user speaks into the microphone 66, whereby the audio signal is converted into a digital signal by encoder 64 and, optionally, compressed. The digital signal is stored in storage unit 70, and the user is ready to place his telephone call. Off-hook detector 78 detects when the user goes off hook and enables transmitting circuit 76. At this point, transmitting circuit 76 places a predetermined signal on the telephone line, which is recognized by the central office as indicating that a digital audio message is waiting. The central office then receives the telephone number dialed by the user in the usual manner and, when dialing is complete sends a predetermined signal over the telephone line indicating to transmitting circuit 76 that it is ready to receive the audio message. Transmitting circuit 76 detects this signal, enables convertor 72 and enables storage units 70 to output the recorded message.

Converter 72 converts the stored words from storage unit 70 into a serial data stream, which is provided to modulator 74. Modulator 74 then produces an FSK signal, which is coupled to telephone line L via AC coupler 46. This FSK signal is provided to the Audio Caller ID receiver 50 at the site of the receiving party.

The message format for Audio Caller ID messages could be similar to that of Fig. 2, except that character 30 is selected to be unique to an Audio Caller ID signal and character 32 would represent the message length in fractions of a second (e.g., 1/8 second increments).

Although preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that many additions,

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2792 2793 2794 2795 2796 2797 2798 2799 2800 2801 2802 2803 2804 2805 2806 2807 2808 2809 2810 2811 2812 2813 2814 2815 2816 2